

**From:** [Juliussen, Lara](#)  
**To:** [Doherty, Kevin](#)  
**Subject:** Re: R code to download oil and gas data  
**Date:** Tuesday, May 27, 2014 1:45:25 PM

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Thanks Kevin,

The code looks straight-forward, so I will pull the files and see if I can tweak the code to preserve all the attributes. I'll save all this to I:\GIS\Data. Good luck with IT.

Lara

Lara Juliussen, Geographer/Ecologist  
Sage-grouse Energy Team  
U.S. Fish and Wildlife Service,  
Region 6, Lakewood, CO  
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On Tue, May 27, 2014 at 1:35 PM, Doherty, Kevin <[kevin\\_doherty@fws.gov](mailto:kevin_doherty@fws.gov)> wrote:

See below for the oil and gas code. It worked slick. The original source data has all of the info on the oil and gas commissions. The step that merges it into one file deletes a lot of the relevant data. We can tweak that code, in R, ESRI, or Stata depending on which is easiest.

The I:/ drives have disappeared on my computer so I need to talk to I.T. AGAIN! I can either send it over when the drive gets mapped or we could run the R code on your computer. If you can read her code and want to run through it or want me to walk you through it, that works for me.

----- Forwarded message -----

**From:** Sharon Baruch-Mordo <[sbaruch-mordo@tnc.org](mailto:sbaruch-mordo@tnc.org)>  
**Date:** Fri, May 23, 2014 at 3:15 PM  
**Subject:** R code to download oil and gas data  
**To:** "Doherty, Kevin" <[kevin\\_doherty@fws.gov](mailto:kevin_doherty@fws.gov)>  
**Cc:** Jeffrey Evans <[jeffrey\\_evans@tnc.org](mailto:jeffrey_evans@tnc.org)>, Dave Naugle <[dave.naugle@cfc.umt.edu](mailto:dave.naugle@cfc.umt.edu)>

Kevin,

I tried to send a zipped file with the data several times today but it keeps failing. At this point I think it is best you run the R code that extracts the data (attached). Make sure to:

- 1) change "YOUR FILE PATH" for the source code AND dir.out lines in the Definitions section (you can run file.choose() in R to navigate to the folder of choice and then copy that string and paste

into the code).

- 2) have the oil\_and\_gas\_functions.r file in that YOUR FILE PATH directory. You don't need to make any changes to this source code!
- 3) have the packages installed as required in the Definitions section - run the lines "load required packages" and R will tell you what isn't installed. The code will not work until you'll have all these packages installed and loaded.

Once you change definitions successfully, you can select all and run in R. The code will generate sub directories under YOUR FILE PATH with each state's name (where processed state's data are saved into one shp file with original attributes maintained), an AllStates directory (where one merged shp for all wells in sage-grouse range is saved but with reduced attributes), and one titled oil and gas with today's date (where source data downloaded from each oil and gas commission website are saved). I commented out the last line of code that deletes the downloaded data directory as it sounds like Kevin may want it. Finally, note that it takes about 5 minutes on my machine to download all states and that every time you rerun the code it will overwrite all files in state's and AllStates directories.

Dave, I think I sent this to you before but I'm cc'ing you again as this is one of the SGI-TNC collaboration products that might be helpful for other analyses that require oil and gas data in sage-grouse range.

Cheers,

Sharon

Please consider the environment before printing this email.

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**Sharon Baruch-Mordo**  
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[nature.org](http://nature.org)

**From:** Doherty, Kevin [mailto:[kevin\\_doherty@fws.gov](mailto:kevin_doherty@fws.gov)]  
**Sent:** Friday, May 23, 2014 8:58 AM  
**To:** Sharon Baruch-Mordo  
**Cc:** Jeffrey Evans  
**Subject:** Re: Lek data format

Sharon,

To keep it simple, could you just send the unmerged state level files. Then we can process them as we need to.

Cheers

Kevin

On Fri, May 23, 2014 at 7:32 AM, Sharon Baruch-Mordo <[sbaruch-mordo@tnc.org](mailto:sbaruch-mordo@tnc.org)> wrote:

Kevin,

What attributes are you looking for? They vary from state to state and we maintained only a few of them all in the merged shp file.

Sharon

Sent from my iPhone

On May 22, 2014, at 11:21 AM, "Doherty, Kevin" <[kevin\\_doherty@fws.gov](mailto:kevin_doherty@fws.gov)> wrote:

Thanks,

Could you send the oil and gas point shape-file separately with attributes? The disturbance index map has a grid with wells, but it has no attributes so we do

not know what kind of well it is.

As far as meta data to the disturbance index is the text below still correct or has the methods changes since we worked on it in 2010? I have figured out already that the well data is no longer from IHS.

Cheers

Kevin

## **METHODS**

### *Disturbance index*

Remotely-sensed landcover classification efforts provide the ability to analyze land-use patterns across very large geographic extents. To develop a consistent disturbance index that is comparable across the US we used data sources that were consistently derived across large geographical/regional scales at a fixed resolution of 30m<sup>2</sup>. The National Land Cover Dataset (NLCD), available from the Multi-resolution Land Characteristics Consortium (MRLC), is a federal multi-agency effort that applies standard class schemas, methodologies, and error assessments to quantify landcover patterns across the entire lower 48 US states. This standardization, while not accounting for fine scale variation in type of disturbance or habitat quality, consistently captures patterns of human-based disturbance. The following NLCD classes were considered to be disturbed lands: Cultivated Crops, Developed-High Intensity, Developed-Low Intensity, Developed-Medium Intensity, Developed-Open Space, and Hay/Pasture. The Hay/Pasture class included planted forage grasses, but did not include unplanted grasslands used for grazing.

We used a Landsat derived impervious surface classification (Yang et al.

2003) to identify areas with reduced percolation such as pavement. The USGS topographic change data (<http://topochange.cr.usgs.gov/>) was used to identify significant topographic change, representing surface mines and other major human-based changes in topography. The USGS uses a threshold for identifying significant topographic change of 10.21-17.57 meters, depending on the land cover type. Oil and gas fields were integrated into the analysis through a kernel density estimate of well locations using IHS energy<sup>®</sup> data (Copeland et al. 2009). Each of the resulting datasets was converted to a binary disturbed/undisturbed classification.

To avoid double-counting disturbance types, we used a conditional statement to create a binary disturbance dataset by defining any pixel classified as disturbed across the four independent datasets (landcover, mined, impervious, and oil & gas) as disturbed, otherwise undisturbed. Since disturbance can exhibit direct and diffuse influences we created an index that represented the influence of proximal disturbance. To account for the proximity and intensity of disturbance, we calculate a ratio of disturbance [disturbed / total] within a 1 km diameter circular moving window using the binary data (Figure 1). All analysis was performed within Workstation Arc/Info.

On Wed, May 21, 2014 at 8:13 PM, Sharon Baruch-Mordo <[sbaruch-mordo@tnc.org](mailto:sbaruch-mordo@tnc.org)> wrote:

Hi Kevin,

File types were generally in excel or csv and a couple of shp files. Data formats were all over the place...

Cheers,

Sharon

**From:** Doherty, Kevin [mailto:[kevin\\_doherty@fws.gov](mailto:kevin_doherty@fws.gov)]  
**Sent:** Tuesday, May 20, 2014 2:40 PM  
**To:** Sharon Baruch-Mordo; Jeffrey Evans  
**Subject:** Lek data format

Sharon and Jeff,

What format did the lek data come in (i.e. excell, access, shapefile, etc). We are going to be sending a formal request for the lek data to the states soon. The letter will more or less be the same one you all saw a month ago. The database folks are trying to build the place for the states to store their lek data and would benefit from knowing the format.

Cheers

Kevin

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